

Lesson of the Week

Complication of the reuse of flow-directed pulmonary artery catheters

G R PARK, D H T SCOTT

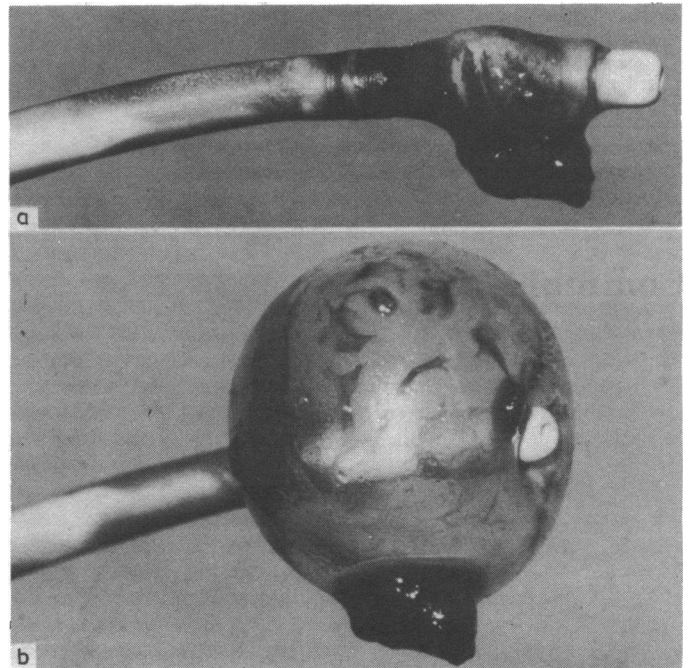
The common complications of flow-directed pulmonary artery catheters are well documented,¹⁻³ and include thrombosis on the catheter surface after prolonged use.³⁻⁶ Because of the high cost of these catheters (three lumen £30, four lumen thermodilution £80) it is tempting to reuse them once after sterilising with ethylene oxide, despite the manufacturer's recommendation to the contrary. We report on two patients in whom reuse was potentially dangerous.

Case reports

Case 1—A 53-year-old woman with a carcinoid tumour of the stomach, intermittent palpitations, and hypertension had a four-lumen thermodilution catheter inserted into a pulmonary artery through an introducer in the right internal jugular vein. The catheter had been used before. After its first use it was washed and then sterilised in 100% ethylene oxide for at least six hours. After insertion the catheter was continuously flushed, using an Intraflow (Sorenson Research Company) device with 5000 units of heparin in 500 ml 0.9% saline. Laparotomy performed under general anaesthesia showed an inoperable primary tumour with multiple metastases and peritoneal seedlings. Further invasive monitoring was not justified and the catheter, followed by the sheath, was removed while she was recovering from anaesthesia 90 minutes after insertion. The introducer lumen was completely filled with clotted blood, which extended 5 cm beyond its tip and appeared to have been stripped off the thermodilution catheter during withdrawal. As the monitoring function of the catheter had been unimpaired there was no reason to have suspected a clot.

Case 2—An obese 52-year-old woman with severe ischaemic heart disease and gall stones was prepared for cholecystectomy. She complained of angina at rest and shortness of breath on minimal exertion. In view of this a triple lumen catheter was floated into a pulmonary artery through an introducer in the left internal jugular vein. The catheter had been used three months earlier and was sterilised as above. Insertion was uncomplicated and good waveforms were obtained. It was flushed in the same way as in case 1. Thirty minutes after insertion the pulmonary artery pressure wave became flattened. The original waveform was restored after rotating the catheter in the sheath. The operation was completed uneventfully and the patient transferred to an intensive care unit. A chest x-ray film showed the catheter tip lying in the right pulmonary artery just distal to the bifurcation. About four hours after insertion the pulmonary

Reuse of expensive disposable flow-directed balloon catheters may be potentially dangerous to the patient



Flow-directed pulmonary artery catheter (a) deflated and (b) inflated with the clot in place.

artery pressure wave again became flattened. Partial inflation of the balloon restored the waveform to normal without wedging occurring. This, and knowledge of the previous case, prompted us to remove the catheter and introducer together. On withdrawal a large clot of blood was adherent to the balloon (figure), partially occluding the tip lumen. Blowing up the balloon moved the clot away from the lumen. It is likely that the clot fragmented during removal and was originally larger than shown.

Comment

It is important in the current financial state of the National Health Service to economise wherever possible. These two patients, however, rapidly developed thrombi on "second hand"

flotation catheters. Thrombosis has been reported previously with new catheters but has usually been noticed when the catheters were removed after several days. One report noted damping of the waveform after two to three hours with increasing difficulty in wedging over the next four to five hours⁴ owing to thrombosis. The patient in case 2 developed this problem within 30 minutes of insertion. We have reused nine catheters for a second time, including the two described here. Clotting may have occurred on these catheters but passed unnoticed because either it did not interfere with their monitoring function or it was stripped off during removal. Several factors may be responsible for the production of thrombus over such a short duration when catheters are reused. The amount of surface damage suffered during insertion will be increased. Lipoproteins are absorbed into the latex of the balloon⁵ during its first use which will not be removed but may be altered by ethylene oxide sterilisation; these will then act as foreign proteins in a second patient.

If it is necessary to reuse intravascular catheters the additional risks to the patient should be carefully considered.

References

- ¹ George RJD. How to insert a flotation catheter. *Br J Hosp Med* 1980;**23**: 296-301.
- ² Elliott CG, Zimmerman GA, Clemmer TP. Complications of pulmonary artery catheterization in the care of the critically ill. *Chest* 1979;**76**: 647-52.
- ³ Foote GA, Schabel SI, Hodges M. Pulmonary complications of flow directed balloon-tipped catheter. *N Engl J Med* 1974;**290**:927-31.
- ⁴ Yorra FH, Oblath R, Jaffe H, Simmons DH, Levy SE. Massive thrombosis associated with the use of the Swan-Ganz catheter. *Chest* 1974;**65**:682-4.
- ⁵ Swan HJC, Ganz W. Use of balloon flotation catheters in critically ill patients. *Surg Clin N Am* 1975;**55**:501-20.

(Accepted 2 October 1981)

Letter from . . . Chicago

Pets and pests

GEORGE DUNEA

Advocates of a liberal education should be pleased to hear that during last year's strike by air controllers a young woman doctor was filling in time at Chicago's O'Hare airport reading *Plutarch's Lives*. The intensity of her concentration, or the size of her book, attracted the attention of the little girl sitting next to her. "Is this a good book," she asked; and on being assured that it was, she further wanted to know if it was as good as *Charlotte's Web*—which she had liked so much that she had read it six times.

The correct answer to this perplexing question might well have been that the main difference between Plutarch's noble Romans and E B White's modern Americans is in their attitude towards pets. Veterans of that traditional occupation lately reclassified as "parenting" will recall that Wilbur, always in danger of being converted into pork chops and sausages, was saved from that ignominious fate by the selflessness of a spider and the tender heart of a young girl. By contrast, the great Julius Caesar, returning victorious from one of his campaigns, was shocked to see certain wealthy strangers in Rome carrying puppy dogs and monkeys in their arms, embracing them, and fussing about them. "Are women in their countries not used to bearing children?" was Caesar's prince-like reprimand. But even the decadent foreigners in Rome might have been surprised at the attention lavished on Chicago's pets, not only in health, when they are merely being paraded up and down Michigan Avenue in their red overcoats, but also in disease—when tonsilectomies and cataract extractions are commonplace, and more heroic life-sustaining procedures corroborate the fact that in America, as in ancient Egypt, the life of animals is sacred.

A new wife for that price

I was first introduced to this concept some 12 years ago, when our vast unexplored basement had become colonised by an undetermined number of stray cats. Among these was one so wild that nobody had ever succeeded getting within five metres of it, until the day when it began to lie about lethargically, seemingly afflicted by Kussmaul respiration. Despite emphatic disclaimers of responsibility on my part, the cat was taken off to the vet ("what, you're not just going to let it die"). Nothing was heard for about six weeks. Then one day, while I was at an important meeting, I was called out by an urgent message from the animal hospital. The cat, I was told, was doing poorly, the peritoneal dialysis had failed, and, since it was not fair to the animal to continue treatment, permission was requested to turn off the respirator.

More recently our 19-year-old cat also began to lie about the house listlessly, looking for all the world as though it had lived the last of its 133 human-equivalent years. This time there being no possible excuse, I soon found myself a reluctant visitor at a modern animal clinic. In the waiting room there was utter pandemonium, as children were shrieking, puppies were yelping, and receptionists were yelling out the names of the next patient to be seen. The walls were covered with pictures of splendid eagles and melancholy cats, there was a large chart of all the families of dogs known to inhabit this planet, a wooden board listed the names of the visiting physicians with their respective degrees, and a suitably impressive plaque commemorated all the selfless benefactors of the institution. We had to wait for a while, the doctors being busy (as we found out later) with two difficult emergencies—a perroquet incommoded by an impacted egg and a turtle afflicted with ulcerative shell disease, a rare condition requiring parenteral gentamicin as well as local applications of iodine. At last we were led past a room filled with "patients" "

Cook County Hospital, Chicago, Illinois, USA
GEORGE DUNEA, FRCP, FRCPED, attending physician